

REMARKS

The amendments set out above and the following remarks are believed responsive to the points raised by the Office Action dated April 11, 2001 and the interview dated March 6, 2001. In view of the amendments set out above and the following remarks, reconsideration is respectfully requested.

Applicants' attorney greatly appreciates the courtesy and careful consideration given by Examiner Ocampo and Examiner Walker during the March 6, 2001 interview. Claims 1-4 have been amended in accordance with the agreement reached during the interview. During the interview, the Examiners were shown a pleated filter element having radially extending pleats having a length of about 35 3/8 inches as measured along the longitudinal axis of the filter element. The inside diameter of the filter element was about 3 1/2 inches. Three views of the filter element were obtained from a copy machine and are attached as Attachments A1-A3.

The independent claims were amended and claims 14-27 have been added, to describe the invention more clearly. No new matter has been added; the basis for the amended claim language may be found within the original specification, claims and drawings. For example, claims 1 and 2 have been amended to define a separation element comprising pleats having a height greater than the distance between the inner and outer peripheries of the pleats and having joiner caps and/or end caps which comprise a polymeric, thermoplastic, or elastomeric material. Claim 3 has been further amended to correct a minor informality and specify that the second segment (rather than the first segment) is mounted to the first end of the pack and that the end cap maintains a fluid-tight seal in both first and second positions. The specification, including the title and abstract, has been amended to conform to the claims as amended. No new matter has been entered.

Claim 1 was rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 5,141,637 to Reed et al. (hereinafter referred to as "Reed (637)") in view of U.S. Patent No. 4,839,048 to Reed et al. (hereinafter referred to as "Reed (048)"). This rejection is respectfully traversed.

Neither Reed (637) nor Reed (048) discloses separation elements as claimed in independent claim 1. Reed (637) is directed to filters having end connectors that can be coupled and uncoupled by hand. Reed (637) fails to disclose joiner caps secured to one another, i.e., fixedly connected, as in welded or bonded together. Furthermore, Reed (637) fails to disclose or even suggest a separation element being at least about 40 inches in length in combination with an interior diameter of at least about 2 inches.

The fact that Reed (048) may disclose a porous medium of polymeric material is of no import. Reed (048) simply does not cure the deficiencies of Reed (637), and therefore, the combination also fails to render the present invention obvious. For example, Reed (048) fails to disclose joiner caps secured to one another, i.e., joiner caps permanently connected together, and fails to disclose a hollow separation arrangement having a length of at least about 40 inches in length and having an interior diameter of at least of about 2 inches. Thus, even assuming arguendo that the skilled artisan was led from the disclosure of Reed (637) to Reed (048), the combination would not result in the claimed invention and therefore the rejection is improper and should be withdrawn.

Furthermore, the Office Action correctly notes that neither Reed (637) nor Reed (048) disclose an interior diameter of at least about 2 inches, but asserts changing the interior diameter of a filter element is an obvious design modification. Applicants respectfully disagree with this assertion.

Neither Reed (637) nor Reed (048) even remotely teach or suggest the importance of a length of at least about 40 inches in combination with an interior diameter of at least about 2 inches. The combination of the length and inner diameter limitations set forth in claim 1 is highly advantageous. As disclosed in the specification, a filter element may not function effectively because the inner diameter is not increased in combination with the length which results in an unacceptably high core pressure differential. There is nothing in Reed (637) or in Reed (48) that would lead one skilled in the art to increase the element length in combination with the interior diameter, let alone to select a length of at least about 40 inches and an interior diameter of at least about 2 inches. Thus, changing the interior diameter is not an obvious design modification based on the disclosures of Reed (637) and Reed (048). For the reasons set forth above, independent claim 1 and those claims depending from claim 1 are patentable.

Claim 2 was rejected under 35 U.S.C. §103(a) as being unpatentable over Reed (048). This rejection is respectfully traversed.

Reed (048) does not disclose or suggest a separation element as claimed in claim 2. For example, Reed (048) fails to disclose any element lengths or diameters, let alone a hollow pack having a length of at least about 40 inches in combination with an interior diameter of at least of about 2 inches. As set forth above, this combination is highly advantageous, and Reed (048) simply would not lead one to this combination. Therefore, Reed (048) fails to render the invention set forth in claim 2 or those claims depending from claim 2 obvious.

Not only do the references fail to render independent claims 1 and 2 obvious, an embodiment of the invention similar to those claimed in independent claims 1 and 2 was awarded the 1999 Vaaler Award by Chemical Processing Magazine. Copies of the pages from

the September 1999 Chemical Processing Magazine, in which the Vaaler Awards were presented, are attached as Attachments B1-B4. The awards are given for products that represent significant advances in the pertinent field of the award. Twelve chief judges and 21 associate judges, each independent and impartial, evaluated the entries and awarded a Vaaler Award to an embodiment corresponding to the inventions defined by independent claims 1 and 2. It is exactly this type objective indicia of non-obviousness that is entitled to great weight in determining non-obviousness of an invention. In light of this award, and the reasons set forth above, it is respectfully contended that claims 1 and 2 are patentable.

Claim 3 was rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 5,435,915 to Connors, Jr. (hereinafter referred to as "Connors, Jr."). This rejection is respectfully traversed.

Connors, Jr. does not disclose an end cap having a first segment and a second segment, but rather, discloses an end connector (20) comprising a single segment. The end connector (20) is configured to engage the end cap of another filter element or to engage a sealing connector (60), when the end connector (20) is adjacent the housing cover. However, the end connector (20) is simply not an end cap. Furthermore, as noted in the Office Action with respect to claim 4, Connors, Jr. discloses a first position wherein the sealing member is relaxed and a second position wherein the sealing member is energized. Thus, Connors, Jr. does not disclose an end cap which is extendable between a first position and a second position and maintains a fluid-tight seal in both positions. The sealing member of Connors, Jr. does not maintain a fluid tight seal in the relaxed position. Accordingly, it is respectfully contended that Connors, Jr. fails to render independent claim 3 or those claims depending from claim 3 obvious.

Claim 4 was rejected under 35 U.S.C. §103(a) as being unpatentable over Connors, Jr. in view of Reed (048). This rejection is respectfully traversed.

As set forth above, Connors, Jr. fails to disclose an end cap, but rather discloses an end connector (20) configured to engage a sealing connector (60). Additionally, as correctly noted in the Office Action, Connors, Jr. fails to disclose a seal having an outer diameter greater than the outer diameter of the second segment of the end cap. However, the Office Action asserts that it would have been obvious to one of skill in the art to modify the sealing member of Connors, Jr. according to the disclosure in Reed (048) of a seal having an outer diameter greater than the end cap. This assertion is respectfully traversed.

There is simply nothing in the disclosure of Connors, Jr. that would lead one of skill in the art to the modification suggested by the Office Action. Connors, Jr. is directed to an axial seal, i.e., a seal that seals under axial compression between axially adjacent members, e.g., two stacked filter elements or a filter element and the housing cover. Reed (048), in contrast,

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discloses a typical O-ring seal, i.e., a seal that seals under radial compression against a radially adjacent member, e.g., the housing sidewall. One of skill in the art reading Connors, Jr. would never replace the axial seal with the radial seal of Reed (048) since there is nothing disposed radially adjacent the filter element of Connors, Jr. Since there is nothing radially adjacent the filter element of Connors, Jr., a radial seal replacing the axial seal would not form a seal at all. Thus, there is simply no motivation to combine these references and it appears that the modification is solely founded on improper hindsight based on Applicants' disclosure. Applicants respectfully submit the obviousness rejection is improper and should be withdrawn.

In the Office Action dated July 19, 2000, the Examiner requested a drawing showing joiner caps. A proposed drawing numbered 14a is attached, the foundation for this drawing being taken from the specification including page 44. No new matter has been entered. Further, Figure 14 has been renumbered Figure 14b. Approval of these changes, shown in red in the attached Request for Approval of Drawing Change, is respectfully requested.

The application is considered in good and proper form for allowance, and the Examiner is respectfully requested to pass this application to issue. If, in the opinion of the Examiner, a telephone conference would expedite the prosecution of the subject application, the Examiner is invited to call the undersigned attorney.

Respectfully submitted,

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PATENT
Attorney Docket No. 168567/PALL

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

CONNORS et al.

Application No. 09/091,508

Art Unit: 1723

Examiner: M. Ocampo

Filed: October 30, 1998

For: SEPARATION
ARRANGEMENT

AMENDMENTS TO SPECIFICATION, CLAIMS, AND ABSTRACT
MADE IN RESPONSE TO OFFICE ACTION DATED APRIL 11, 2001

Amendments to the paragraph beginning at page 3, line 9:

In accordance with one aspect, the present invention is directed to ~~a separation element~~
elements for removing one or more components from a fluid flowing through the separation
element. ~~The, where the separation element comprises two or more hollow pack sections, joiner~~
~~caps, and first and second end caps. Each hollow pack section has first and second ends and an~~
~~entire and includes a porous medium which comprises a polymeric material or a glass fiber~~
~~material.~~ Each hollow pack section includes a plurality of pleats, a retainer, first and second
ends, and a porous medium. The plurality of pleats have roots, crowns, legs extending
between the roots and the crowns, an inner periphery at the roots defining a upstream side,
and an outer periphery at the crowns defining a downstream side. The height of each pleat is
greater than $(D-d)/2$, where D is the outer diameter at the outer periphery of the pleats and d
is the inner diameter at the inner periphery of the pleats. The retainer is disposed around the
plurality of pleats. The porous medium comprises a polymeric material or a glass fiber
material. The joiner caps are attached to at least one end of each of the two or more pack
sections and adjacent joiner caps are connected secured to coaxially secure connect the pack
sections and joiner caps into a hollow separation arrangement which is at least about forty
inches in length and has an interior diameter of at least about two inches. The first and
second end caps are attached to the hollow separation arrangement. One of the first and
second end caps comprises a seal which has an outside diameter greater than the largest
outside diameter of the hollow separation arrangement. The joiner caps and the end caps
include a polymeric, thermoplastic or elastomeric material.

Amendments to the paragraph beginning at page 3, line 21:

In accordance with a further aspect, the present invention is directed to ~~a separation element. The elements for removing one or more components from a fluid flowing through the separation element, where the separation element comprises a hollow pleated pack which has an interior and no more than two end caps connected to ends of the pack. The hollow pleated pack includes a porous medium comprising a polymeric material or a glass fiber material and includes a plurality of axially extending circumferentially spaced side seals and first and second end caps. The hollow pleated pack includes a plurality of pleats, a retainer, first and second ends, and a porous medium. The plurality of pleats includes roots, crowns, legs extending between the roots and the crowns, an inner periphery at the roots defining an upstream side, and an outer periphery at the crowns defining a downstream side. Each pleat has a height greater than $(D-d)/2$ where D is the outer diameter at the outer periphery of the pleats and d is the inner diameter at the inner periphery of the pleats. The retainer is disposed around the pleats. The porous medium comprises a polymeric material or a glass fiber material. The hollow pleated pack is at least forty inches in length and has an interior diameter of at least two inches. Each end cap is connected to an end of the pack. One of the first and second end caps includes a seal having a larger outside diameter than the largest outside diameter of the hollow pleated pack and the other end cap. The end caps include a polymeric, thermoplastic or elastomeric material.~~

Amendments to the paragraph beginning at page 3, line 28:

In accordance with a further aspect, the present invention is directed to ~~a separation elements. The elements, where the separation element comprises a pleated pack and an end cap. The pleated pack includes a porous medium and a first end and has a length greater than about forty inches and an interior diameter greater than about two inches. The end cap includes a first segment mounted to the first end of the pack and a second segment mounted to the first end of the cap spaced from the first end of the pack. The first and second segments are arranged to slide with respect to one another. The end cap is extendable from a first position in which the first and second end caps are spaced a first distance from each other to a second position in which the first and second end caps are spaced a second distance from each other. The second distance is greater than the first distance, and the end cap maintains a fluid tight seal in both positions.~~

Amendments to the paragraph beginning at page 4, line 9:

In accordance with a further aspect, the present invention is directed to ~~a separation element. The elements, where the separation element comprises a pack which includes a porous~~

medium and a first end, and an end cap having a first segment, a second segment mounted to the first end of the pack, and a sealing member coupled to at least one of the first and second segments. The first segment is slidably engaged to the second segment such that the first segment is movable between first and second positions. ~~When in~~In the first position, the sealing member is relaxed, and in the second position, the sealing member is compressed by the first and second segments and thereby energized and has an outer diameter greater than the outer diameter of the second segment of the end cap.

Amendments to the paragraph beginning at page 4, line 18:

~~In accordance with another aspect, the present invention is directed to a separation assembly. The separation assembly comprises~~In embodiments of the present invention, a separation assembly may comprise a support cage and a separation element. The separation element is removably mounted in the support cage and comprises a pack having an inner region and first and second ends which include a porous medium having pleats in a laid-over pleat configuration, a retainer arranged with the pack to maintain the pleats in the laid-over configuration, and first and second end caps which are connected to the first and second ends of the pack. The separation element is free of any support structure in the inner region of the pack.

Amendments to the paragraph beginning at page 4, line 27:

~~In accordance with a further aspect, the present invention is directed a separation assembly. The separation assembly comprises~~In embodiments of the present invention, a separation assembly may comprise a support cage having a first end and a separation element removably mounted in the support cage. The separation element includes a pack and at least one end cap mounted to the pack. The at least one end cap is extendable to allow the separation element to move from a position removed from the first end of the support cage to a position in proximity to or in contact with the first end of the support cage to reduce loading on the separation element.

Amendments to the paragraph beginning at page 5, line 3:

~~In accordance with a further aspect, the present invention is direction to a separation assembly. The separation assembly comprises~~In embodiments of the present invention, a separation assembly may comprise a support cage having a first end, a seat arrangement, and a separation element removably mounted in the support cage. The separation element includes a pack and at least one end cap mounted on the pack. The at least one end cap includes a seal arrangement which slidably engages the seat arrangement. The separation element is axially movable within the support cage from a first position. The seal arrangement engages the seat

arrangement and the separation element is spaced from the first end of the support cage to a second position wherein the seal arrangement engages the seat arrangement of the separation element and is closer to the first end of the support cage.

Amendments to the paragraph beginning at page 5, line 14:

~~In accordance with a further aspect, the present invention is directed to an end cap for capping an end of a separation pack. The end cap comprises~~ In embodiments of the present invention, an end cap for capping an end of a separation pack may comprise a first segment including a first surface mountable to the end of the separation pack and a second segment including a sealing surface. The first and second segments are extendably connected such that the second segment is movable relative to the first segment.

Amendments to the paragraph beginning at page 7, line 19:

Figure 13a and 13b are sectional views of an alternative embodiment of the filter assembly of the present invention.

Figure 14a is a plan view of a portion of a hollow filter arrangement including pack sections connected by joiner caps.

Amendments to the paragraph beginning at page 7, line 21:

~~Figure 14 is a top~~ Figure 14b is an oblique view of a filter pack having multiple side seals.

Amendments to the paragraph beginning at page 44, line 1:

In accordance with another aspect of the invention, both the length and the diameter, especially the inner diameter of the filter element may be increased. ~~The~~ As shown in Figure 14(a), the longer, larger diameter filter elements are preferably constructed by joining together two or more shorter filter pack sections 216a, 216b using open end cap unions or joiner caps 221a, 221b to achieve hollow filter arrangements 217 with lengths of preferably greater than forty inches and interior diameters of at least two inches, more preferably greater than sixty inches and interior diameters of at least three inches and more preferably about four or more inches. Essentially, as the length of the filter elements is increased, the inside diameter is also preferably increased to reduce the core pressure differential. Depending on the length of the particular filter element and the lengths of the shorter filter pack sections, one or more pairs of joiner caps may be utilized. The two end caps utilized in these longer, larger diameter filter elements may comprise any suitable configuration such as those described above. However, one of the end caps joined to the filter pack preferably comprises

a slidable end cap such as the slidable end cap 220 illustrated in Figure 12. The slidable end cap 220 allows for axial movement of the filter element 212 while providing a fluid tight seal via a seal 228 having an outside diameter greater than the largest outside diameter of the hollow filter element 212. The filter pack may comprise any suitable medium such as described above. Preferably, the filter pack comprises a material and configuration which is capable of supporting its own weight, wet or dry, without an interior or exterior support structure even at lengths greater than forty inches. In a preferred embodiment, the filter pack comprises a glass fiber medium having a pleated structure. The pleats may extend radially or they may be in a laid-over configuration as described in detail above.

Amendments to existing claims:

1. (Twice Amended) A separation element for separating one or more components from a fluid flowing through the separation element, the separation element comprising:

(a) two or more hollow pleated pack sections, each pack section having a plurality of pleats, wherein the plurality of pleats includes roots, crowns, legs extending between the roots and the crowns, an inner periphery at the roots defining an upstream side, and an outer periphery at the crowns defining a downside side and wherein each pleat has a height h greater than $(D-d)/2$ where D is the outer diameter at the outer periphery of the plurality of pleats and d is the inner diameter at the inner periphery of the plurality of pleats, a retainer disposed around the pleats, first and second ends ~~and an interior and including,~~ and a porous medium comprising a polymeric material or a glass fiber material;

(b) joiner caps attached to at least one end of each of the two or more pack sections, adjacent joiner caps being ~~connected~~ secured to coaxially ~~secure~~ connect the pack sections and joiner caps into a hollow separation arrangement being at least about 40 inches in length and having an interior diameter of at least of about 2 inches; and

(c) first and second end caps attached to the hollow separation arrangement, wherein one of the first and second end caps comprises a seal having an outside diameter greater than the largest outside diameter of the hollow separation arrangement, ~~the joiner caps and the end caps including a polymeric, thermoplastic or elastomeric material.~~

2. (Twice Amended) A separation element for separating one or more components from a fluid flowing through the separation element, the separation element comprising:

(a) a hollow pleated pack having a plurality of pleats, wherein the plurality of pleats includes roots, crowns, legs extending between the roots and the crowns, an inner periphery at the roots defining an upstream side, and an outer periphery at the crowns defining a

downstream side and wherein each pleat has a height h greater than $(D-d)/2$ where D is the outer diameter at the outer periphery of the pleated pack and d is the inner diameter at the inner periphery of the pleated pack, a retainer disposed around the pleats, first and second ends ~~and an interior and including~~, and a porous medium comprising a polymeric material or a glass fiber material, the hollow pleated pack being at least about 40 inches in length and having an interior diameter of at least about 2 inches; and

(b) first and second end caps, each end cap being connected to an end of the pack, wherein one of the first and second end caps includes a seal having a larger outside diameter than the largest outside diameter of the hollow pleated pack and the other end cap and wherein the end caps include a polymeric, thermoplastic or elastomeric material.

3. (Thrice Amended) A separation element comprising:

(a) a pleated pack including a porous medium and a first end and having a length greater than about 40 inches and an interior diameter greater than about 2 inches; and

(b) an end cap including a first segment and a second segment mounted to the first end of the pack, wherein the first and second segments are slidably arranged with one another and wherein the end cap being is extendable from a first position in which the first and second segments are spaced a first distance from each other to a second position in which the first and second segments move away from one another and are spaced a second distance from each other, the second distance being greater than the first distance, the end cap maintaining a fluid-tight seal in both positions.

4. (Twice Amended) A separation element comprising:

(a) a pack including a porous medium and a first end; and

(b) an end cap having a first segment, a second segment mounted to the first end of the pack, and a sealing member coupled to at least one of the first and second segments, the first segment slidably ~~engaged to~~ engaging the second segment such that the first segment is movable between first and second positions, wherein in the first position, the sealing member is relaxed, and in the second position, the sealing member is compressed by the first and second segments, thereby energizing the sealing member, and has an outer diameter greater than the outer diameter of the second segment of the end cap.

Amendments to the Abstract:

ABSTRACT

~~A separation assembly includes a separation element disposed in a reusable cage. The separation element preferably has a pleated pack with the pleats in a laid over pleat configuration and two end caps. One of the two end caps is expandable or slidable between a first position and a second position for reducing the forces acting upon the separation element while maintaining a fluid tight seal when the separation element is under the influence of these forces. The application also concerns elongated hollow separation elements which are formed on the one hand of a single hollow pleated pack, on the other hand of adjoining pack sections. It further deals with the arrangement and maintaining of the pleats of the porous medium of the separation element.~~ Separation elements may comprise two or more hollow pleated pack sections, joiner caps, and first and second end caps. The joiner caps are attached to at least one end of each of the two or more pack sections. Adjacent joiner caps are secured to coaxially connect the pack sections and joiner caps into a hollow separation arrangement which is at least about 40 inches in length and which has an interior diameter of at least about two inches. The first and second end caps are attached to the hollow separation arrangement. Separation elements may also comprise a hollow pleated pack and first and second end caps. The hollow pleated pack is at least about forty inches in length and has an interior diameter of at least about two inches. The first and second end caps are connected to the ends of the pack. Separation elements may also comprise a pleated pack and an end cap. The end cap includes a first segment and a second segment mounted to one end of the pack. The first and second segments are slideably arranged with one another and the end cap is extendable from a first position to a second position. The separation element may also comprise a pack and an end cap having a first segment, a second segment mounted to a first end of the pack, and a sealing member coupled to at least one of the first and second segments. The first and second segments are movable with respect to each other from a first position in which the sealing member is relaxed to a second position in which the sealing member is compressed by the first and second segments.